UNIVERSITY OF CALIFORNIA, DAVIS

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SANTA BARBARA • SANTA CRUZ

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OFFICE OF THE VICE CHANCELLOR FOR RESEARCH
(530) 752-2075
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410 Mrak Hall, One Shields Avenue
DAVIS, CALIFORNIA 95616-8671

CALFED Bay-Delta Program Office
1416 Ninth Street, Suite 1155
Sacramento, CA 95814

MAY 1 2 2000

Dear Colleague:

2001 Proposal Solicitation
Proposal Entitled "Food Resources for Zooplankton in the Sacramento-San Joaquin River Delta"
Principal Investigator: Charles Goldman

It is a pleasure to present for your consideration the referenced proposal.

Following the direction of "**Attachment D -Terms and Conditions for State Proposition 204 Funds",** this is to provide notification that the applicant takes exception to the following proposed "standard clauses:

Section 6. Substitution
Section 9. Rights in Data
Section 11. Indemnification, and
Standard Clauses-Insurance Requirements - DWR

In order to bring the above provisions into conformity with the University of California Policy, we reserve the right to discuss with the aim of properly modifying these sections, should this proposal result in a subsequent award.

Please contact the principal investigator for scientific information. Administrative questions may be directed to my assistant, Ms. Petrina Ho, or me by telephone, facsimile or electronic mail at the numbers cited above. Furthermore, correspondence pertaining to this proposal and any subsequent award should be sent to the Office of Research and to the principal investigator.

Sincerely,

Sandra M. Dowdy
Contracts & Grants Analyst

Enclosures
Cc: C. Goldman

Attachment H

Proposal # 2001-R-221 (Office Use Only)

PSP Cover Sheet (Attach to the front of each proposal)

Proposal Title: Food Resources for Zooplankton in the Sacramento-San Joaquin River Delta

Applicant Name: The Regents of the University of California, UC Davis Campus

Contact Name: Dr. Charles R. Goldman

Mailing Address: Dept. of Environmental Science & Policy, Univ. of California, Davis, CA 95616-8576

Telephone: (530)752-1557

Fax: (530)752-3350

Email: crgoldman@ucdavis.edu

Amount of funding requested $576,422

Some entities charge different costs dependent on the source of the funds. If it is different for state or federal funds list below.

State cost _____ Federal cost _____

Cost share partners? ___ Yes _x_ No

Identify partners and amount contributed by each _____

Indicate the Topic for which you are applying (check only one box).

- ☐ Natural Flow Regimes
- ☐ Nonnative Invasive Species
- ☐ Channel Dynamics/Sediment Transport
- ☐ Flood Management
- ☐ Shallow Water Tidal/ Marsh Habitat
- ☐ Contaminants
- ☐ Beyond the Riparian Corridor
- ☐ Local Watershed Stewardship
- ☐ Environmental Education
- ☐ Special Status Species Surveys and Studies
- ☒ Fishery Monitoring, Assessment and Research
- ☐ Fish Screens

What county or counties is the project located in? Solano, Sacramento, Yolo, San Joaquin, Stanislaus, Contra Costa

What CALFED ecozone is the project located in? See attached list and indicate number. Be as specific as possible 1 & 2 (plus directly adjacent zones)

Indicate the type of applicant (check only one box):

- ☐ State agency
- ☐ Public/Non-profit joint venture
- ☐ Local government/district
- ☒ University
- ☐ Other: _____
- ☐ Federal agency
- ☐ Non-profit
- ☐ Tribes
- ☐ Private party

Indicate the primary species which the proposal addresses (check all that apply):

- ☐ San Joaquin and East-side Delta tributaries fall-run chinook salmon
- ☐ Winter-run chinook salmon
- ☐ Spring-run chinook salmon
- ☐ Late-fall run chinook salmon
- ☐ Fall-run chinook salmon
- ☒ Delta smelt
- ☐ Longfin smelt
- ☒ Splittail
- ☐ Steelhead trout
- ☐ Green sturgeon
- ☒ Striped bass
- ☐ White Sturgeon
- ☐ All chinook species
- ☐ Waterfowl and Shorebirds
- ☒ All anadromous salmonids
- ☐ Migratory birds
- ☐ American shad
- ☐ Other listed T/E species: _____

Indicate **the** type **of** project (check only **one box):**

- ☒ Research/Monitoring
- ☐ Watershed Planning
- ☐ Pilot/Demo Project
- ☐ Education
- ☐ Full-scale Implementation

Is this a next-phase of an ongoing project? Yes ___ No X

Have you received funding from CALFED before? Yes X No ___

If yes, list project title and CALFED number 98-2015000-00096 ("Assessment of the Sacramento-San Joaquin River Delta as Habitat for the Production of the Food Resources that Support Fish Production")

Have you received funding from CVPIA before? Yes ___ No X

If yes, list CVPIA program providing funding, project title and CVPIA number (if applicable):

_____

By signing below, the applicant declares the following:

- The truthfulness of all representations in their proposal;
- The individual signing the form is entitled to submit he application on behalf of he applicant (if Re applicant is an entity or organization); and
- The person submitting the application has **read** and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waives any and all rights to privacy and confidentiality of he proposal **on** behalf of the applicant, to the extent as provided in the Section.

Sandra M. Dowdy
Contracts and Grants Analyst

Printed name of applicant

Sandra M. Dowdy

ignature of applicant

University of California, Davis
Federal Form for Disclosure of Financial Interests Related to Sponsored Projects

Project Cover Sheet

The principal purpose for requesting the information on this form is to comply with university policy and federal regulations regarding disclosure of any financial interest that would reasonably appear to be affected by the conduct of a sponsored project. Provision of the information is mandatory if you want to submit a proposal for support of a project covered by the terms of this policy. This information will be used to implement the University of California Policy on Disclosure of Financial Interests and Management of Conflicts of Interest Related to Sponsored Projects. The information may be released or transmitted to the sponsor, including federal agency representatives, and, according to state law, may also be released to the public upon request.

Principal Investigator: **Name, Last** Goldman **First** Charles MI R.

PI Social Security # 344-20-9186 **E-mail** crgoldman@ucdavis.edu

PI Department: ESP **Position:** Professor **Phone:** 2-1557

Proposal Title: Food Resources for Zooplankton in the Sacramento-San Joaquin River Delta

Sponsor Name: CALFED

This submittal is for a:

- [X] **New Proposal**
- [ ] **Competing Continuation/Renewal - Current Award No:** _____
- [ ] **Continuations - Current Award No:** _____
- [ ] **New Investigator Added to Project**
- [ ] **Subcontract - Name of Entity:** _____
- [ ] (If **non-governmental - PI must also complete Form 730-U**) **Updates - Newly Acquired Interests**

OVCR Use Only:
Cycle # _____
Code _____

Disclosure and Certification

It is the responsibility of the Principal Investigator to identify all individuals who must file a Disclosure of Financial Interest. **All** investigators acknowledge their responsibility to disclose any new reportable financial interests obtained during the term of the project. By signature you are certifying whether a financial interest exists (attach "Description ***of Financial Interest"*** for each entity in which a financial interest exists.)

Do you, your spouse, or dependent children have any financial interests related to the work to be conducted under the sponsored project? (See reverse for complete description of definitions) **I declare under penalty of perjury that I have used all reasonable diligence in preparing this Disclosure and to the best of my knowledge it is true and complete.** Attach list if more space is needed for investigators.

1. [X] No [ ] Yes, Description of interest attached
   Charles R. Goldman — Signature, Principal Investigator — 5/11/00 Date
   Charles R. Goldman
   Print or Type Name of Principal Investigator

2. [X] No [ ] Yes, Description of interest attached
   (currently overseas) — Signature, Researcher — 5/11/00 Date
   Alan D. Jassby
   Print or Type Name of Researcher

3. [X] No [ ] Yes, Description of interest attached
   Signature, Researcher — 5/11/00 Date
   Anke Mueller-Solger
   Print or Type Name of Researcher

[Retention: Three (3) years after termination of sponsored project or until resolution of any action by the sponsor, whichever is longer]
Office of Record: Office of the Vice Chancellor for Research/Sponsored Programs

12/97

Office of Research/OVCR, University of California, Davis

DATA SHEET FOR CONTRACT AND GRANT PROPOSALS

See Sponsored Research Manual Section 230 for Instructions

1 Principal Investigator:	2 Payroll Tile:	3 SSN:'
Charles R. Goldman	Professor	344-20-9186

4 Telephone:	5 Fax:	6 E-mail:
2-1557	2-3350	crgoldman@ucdavis.edu

7 Administering Dept/Unit:	8 Department Pickup:		
ESP	Yes ☒	No ☐	If yes, call: Anke Mueller-Solger 2-2913/2-3938

9 DaFIS Account Number::	10 Six Digit Account Number:	11 Four digit mail ID Code:
		7483

12 Department Contact:	13 Telephone:	14 Fax:
Anke Mueller-Solger	2-2913/2-3938	2-3350

15 Proiect Title:

Food Resources for Zooplankton in the Sacramento-San Joaquin River Delta

16 Sponsor Name and Address; indicate the name of the organbation which will directly provide funding to UC Davis:

CALFED Bay-Delta Program Office
1416 Ninth Street, Suite 1155
Sacramento, CA 95814

Attn:

17 Sponsor Deadline:		18 PI/Co-PI(s) Disclosure of Financial Interest: Attached		
Date: 5/15/00 – 3:00 p.m.	☐ Receipt Date ☐ Postmark Date	☐ Non-Government	☐ PHS/NSF	☐ Not Applicable

19 Type of Request:					20 Response to RFP, RFA, RFQ, BAA:	
☒ New	☐ Continuation'	☐ Renewal'	☐ Supplement*	☐ Revision	☐ Yes	☐ No
*Indicate Current Award Number:					(If Yes, attach a copy)	

21 Project Type:

☐ Basic Research	☒ Applied Research	☐ Developmental Research	☐ Public Service
☐ Other Research	☐ Training	☐ Equipment	☐ Other

22 Place(s) of Performance (list all locations including subcontractors):

Campus Location(s): 3117 Wickson

Off-Campus Location(s): San Francisco Bay-Delta

Total percent time:
On Campus (%): 10%
Off Campus (%): 90%

23 Subcontract(s) to other institutions:

☐ Yes ☒ NO If Yes, list Institution(s):

24 Project Period (mm/dd/yy):		25 Amount Requested:	Matching Funds:
From: 1/1/01	To: 12/31/03	576,422	N/A

Office of Research Use Only

Assistant _____ Due Date _____ Posted _____

26 Indirect Cost Rate:

26.0 % Base: [X] MTDC [ ] TDC [ ] TC [ ] Other

27 safely:

[X] Yes	[ ] No	Do you have an injury prevention program?
[ ] Yes	[X] No	Carcinogens? **If** Yes. CUA#:
[ ] Yes	[X] No	Ionizing Radiation? If Yes, RUA#:
[ ] Yes	[X] No	Pathogenic Agents? **If** Yes, BUA#:
[ ] Yes	[ ] No	Recombinant DNA? **If** Yes, GUA#:
[ ] Yes	[X] No	Federally Regulated Drugs or Controlled Substances?
[ ] Yes	[X] No	Will you produce medical waste?

28 Vertebrate Animals:

[ ] Yes [X] No **If** Yes, Protocol Number: Approval Date:

29 Human Subjects: [ ] Yes [X] No (**If** Yes, complete 29a and/or 29b)

a **PI** on Protocol:

Title of Protocol:

Protocol Number: Approval Date:

b **PI on** Exemption:

Title of Exemption:

Category Number: Approval Date:

Office of Research Use Only

Project #:

Transaction #:

Agency Code:

Type of Agreement:
[ ] Grant
[ ] Contract
[ ] Coop Agreement
[ ] Clinical Trial
[ ] Other

Other:
[ ] IDC Waiver
[ ] Equipment
[ ] Subcontract Plan
[ ] PI Exception
[ ] OVCR Matching
[ ] Limited Submission
[ ] To UCOP

Only original signatures are acceptable. Signature stamps or "per" signatures should not be used.

By signing the Data Sheet the Principal Investigator certifies that he/she will comply with sponsor policies and university policies and regulations addressed in Section 230, Exhibit A *of* the Sponsored Research Manual. The Dept Chair/Division Director's signature indicates that the project is within the scope *of* the unit and that approval is given to commit personnel and resourced to the project.

Signatures

Principal Investigator: 5/11/00
Principal Investigator Date

Dept Chair/Division Director: 5/11/00
Date

Dean (if applicable): Date

Other (if required): Date

* FEDERAL PRNACY NOTICE. Pursuant to the Federal Privacy *Act* of 1974, you are hereby notified that disclosure of your social security number is voluntary. This record keeping system was established pursuant lo the authority of The Regents of the University of California under Article IX, Section 9 of the California Constitution. The social security number is used lo verify your identity and vvil be kept confidential by the Office of the Vice Chancellor for Research.

Title: ***Food resources for zooplankton in the Sacramento-San Joaquin River Delta.***
Amount requested: $576,422.-
Applicant: The Regents of the University of California, U.C. Davis Campus
Contact: Dr. Charles R. Goldman, Department of Environmental Science and Policy,
1 Shields Avenue, U.C. Davis, Davis, CA 95616,
Phone: (530) 752-1557, crgoldman@ucdavis.edu
Other Participants: Dr. Alan Jassby, Department of Environmental Science and Policy,
1 Shields Avenue, U.C. Davis, Davis, CA 95616
Dr. Anke Mueller-Solger, Project Manager, Department of Environmental Science and Policy, 1 Shields Avenue, UC Davis, Davis, CA95616
Phone: (530) 752-2913; Fax: (530) 752-3350; **abmuellersolger@ucdavis.edu**

B. EXECUTIVE SUMMARY

This proposal describes an assessment of the quantity and quality of food resources for copepods in various habitats of the Sacramento-San Joaquin River Delta. We do not propose to implement a restoration project; instead, we will provide essential information for the success of restoration projects. As outlined in the proposal, the information gained through our study will contribute to the achievement of virtually all stated ERP goals.

Copepods are one of the two numerically dominant groups of meso-zooplankton in the Delta. They are essential prey for larval and small adult fish including Delta smelt, Sacramento splittail, young chinook salmon, and young striped bass. In recent decades, copepod abundances in the Delta have declined and native copepods now have to compete with several exotic copepod species. These changes have resulted in decreased availability of suitable food for small fish. This is likely one of the reasons for the decline of many fish species, including species that are now listed as threatened and endangered. The decline of copepod abundances coincides with density decreases and species shifts in the Delta phytoplankton community. This leads us to suspect that copepods in the Delta are now often food limited. Our project is designed to assess the nutritional requirements of Delta copepods, which habitats meet these requirements, and how Delta food quantity and quality for copepods have changed over time. With the help of nutritional biomarkers, we will also evaluate the species- and habitat-specific nutritional value of copepods for fish production. We will characterize and quantify energy transfer pathways and efficiencies from producers via copepods to fish. These ecosystem functions are central to success and failure of restoration projects as well as to an increased understanding of biotic contaminant transfers. Our goal is to provide the scientific basis for guiding and evaluating Delta management and restoration. One of the key assumptions of the CALFED ecosystem restoration plan is that habitat restoration will increase food supply to the estuary. However, little is known about the relative importance of different habitat types or the major pathways to higher trophic levels. We will provide information and make recommendations about how different habitats support zooplankton and which habitat characteristics maximize energy transfer to fish. We will gain this information through the completion of several related tasks including field sampling, field and laboratory feeding experiments, and statistical analyses of the long-term IEP phytoplankton and zooplankton records. With the proposed project we will continue and complement an ongoing, CALFED sponsored study. In the ongoing study we focus on the second numerically dominant meso-zooplankton group in the Delta, cladocera, which are also an important food resource for fish. Together, our current and proposed projects will remove much of the scientific uncertainty concerning types of energy sources for successful fish production, trophic pathways, and resource limitation in the Delta, which will lead to better management and restoration strategies.

C. PROJECT DESCFUPTION (Without figures: ***6.3*** pages.)

1. Problem Statement.

a): Theproblem /ecosystem goals:

One of the primary goals of restoration efforts in the Sacramento-San Joaquin River Delta (hereafter: the Delta) identified by CALFED is to assure growth and survival of at-risk and harvestable species. Organisms in decline in the Delta include various native and harvestable fish species [7, 11, 21, 28, 29], as well as their food resources such as zooplankton and other invertebrates[20, 35, 36, 37], and primary producers[3, 24]. Furthermore, shifts in species dominance have taken place at all trophic levels [12, 15, 25], often with exotic invaders replacing native species. There is still a large amount of uncertainty concerning the mechanisms responsible for the declines in species productivity and abundance. Also, much remains to be learned about the effects of introduced species on food web structure and dynamics essential for the success or demise of native species, and about species-specific resource requirements. Improved understanding in these areas is critical for successful resource management and restoration. As part of a large collaborative CALFED sponsored study we are currently investigating food availability and nutritional quality for cladocerans, a filter-feeding type of zooplankton that is a major food resource for fish, as well as the origin of organic matter in the Delta. The work proposed here is a logical extension of this study to include copepods, another zooplankton component important for fish production in the Delta. The main question is: does the quantity and quality of available food resources limit zooplankton, and specifically native and exotic copepod abundances in various Delta habitats?

b) Conceptual model:

A goal for adaptive management is to find out which hydrologic regimes and habitat configurations will favor transfer of energy and nutrients to at-risk or otherwise desirable species. Inflow, residence time, water depth, temperature and water quality (light penetration, nutrients) will determine the type and amount of primary (algal and vascular plant) production in Delta habitats and microbial transformations of detrital organic carbon into food sources for zooplankton. Because of the different dietary requirements of zooplankton, different types of production will favor dominance by different types of zooplankton. These in turn will determine the success of native and non-native fishes (Figs. 1 and 2).

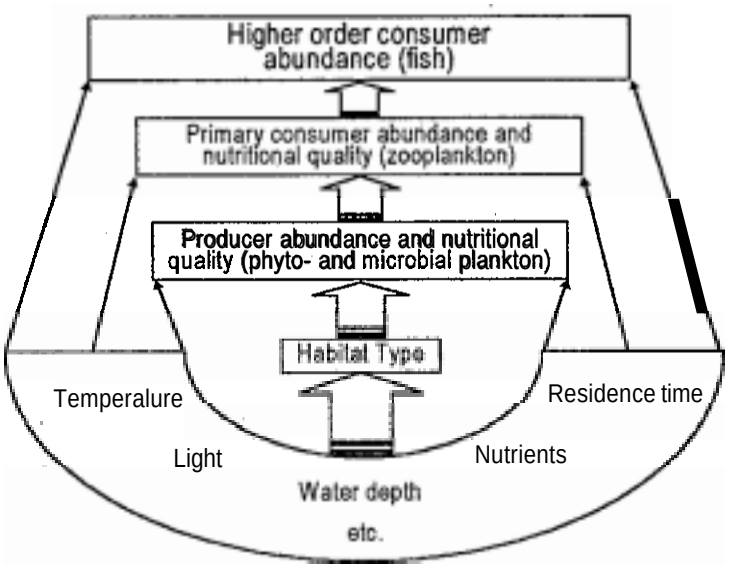


Figure 1: Factors determining fish production in the Delta.

In the Delta, phytoplankton consisting of photosynthetically active planktonic algae generally produces a large proportion of the organic carbon and energy resources available to consumers such as zooplankton and fish [16]. Detrital matter (dissolved and particulate) is another source of energy for consumers when recycled and repackaged into edible form by members of the microbial food web (bacteria and protozoa) [5, 13]. The phytoplankton community often undergoes seasonal successions with more edible and nutritious, fast growing taxa (e.g. diatoms, chrysophytes) dominating early in the growing season and less edible taxa (filamentous green algae and cyanobacteria) later in the season [40]. Changes in food quality are especially pronounced in more eutrophic systems [33]. Seasonal successions within the microbial community remain less well understood [23], and largely uninvestigated in relation to the nutritional quality of microbial production for consumers.

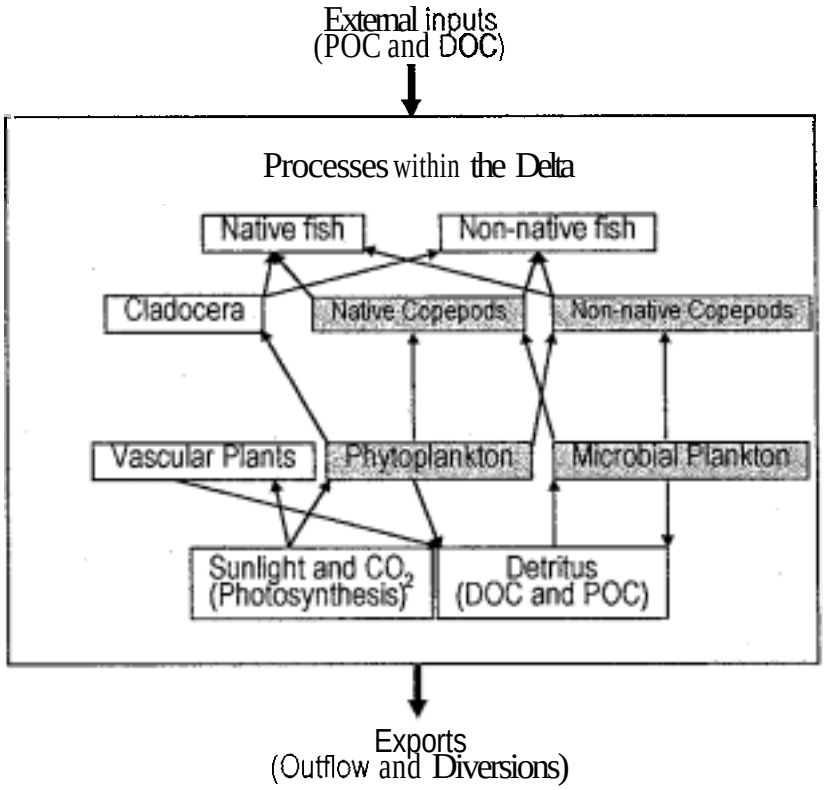


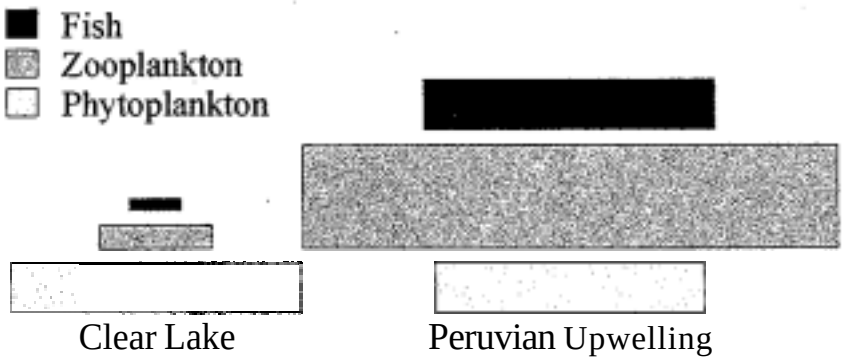
Figure 2: Simplified pelagic food web model with components discussed in this study. Arrows: Carbon and energy flow (without respiration). Shaded: Target components of this study.

Among primary consumers, different groups have different dietary needs. Our own recent findings show that cladoceran zooplankton in the Delta need good-quality phytoplankton for optimal growth and reproduction (Mueller-Solger, unpublished data). In low-residence time, deep, and turbid habitats (leveed channels) they are commonly limited by insufficient phytoplankton availability, while shallower habitats with higher residence times and greater clarity (marshes, flooded islands, flood plains) often provide near optimal dietary conditions. The second major zooplankton group in the Delta is calanoid and cyclopoid copepods. Many calanoid copepods are largely herbivorous, but have also been shown to greatly suppress protozoa [31] and can feed directly on detritus [34]. Cyclopoid copepods are often carnivorous or omnivorous and include microzooplankton such as rotifers, nauplii, and protozoa in their diets [31]. Copepod food requirements and limitations in the Delta may thus differ substantially from those of the cladocerans. It is currently unclear how the dietary requirements of native and non-native copepods in the Delta differ, and if specific habitats would favor native copepods by producing their preferred food. We expect to find answers to these questions through this study. Learning which conditions

are most suitable for native copepods will enable us to give recommendation about how to manage for their dominance. There is some evidence that native fish recruitment is better when feeding on native copepods [7, 30]. Native fish should thus profit from management for native copepod dominance.

Another aspect of this study is the chemical nutritional quality of zooplankton, which may differ even within species depending on the types of food available to these organisms. Primary consumers such as copepods eating more nutritious food are themselves more nutritious for secondary consumers such as fish. This has been shown in aquaculture studies [38, 42, 43] as well as in some field studies in lakes [1]. Habitats producing more nutritious zooplankton should have better nutritional conditions for and thus higher abundances of fish. Overall, our goal is to determine which habitat configurations will lead to desirable "inverted Eltonian biomass pyramids" (greater standing stocks **of** higher trophic levels than lower trophic levels due to highly efficient energy transfers) versus less desirable "regular Eltonian biomass pyramids" [8].

Figure *3:* Eltonian biomass pyramids for hypereutrophic Clear Lake and the ocean upwelling zone near the Peruvian coast. **Box** size: proportional to biomass. Redrawn from Brett and Mueller-Navarra, 1997[8].



c) Hypotheses:

We will test the following hypotheses:

1. Delta copepods are limited by the quantity of available food resources.
2. Delta copepods are limited by the quality of available food resources.
3. Food quantity and quality for copepods in the Delta differ seasonally.
4. Food quantity and quality for copepods in the Delta differ between different habitats.
5. Food resources for copepods in the Delta are better in shallow, nutrient rich habitats with higher residence times (flood plains, flooded islands, marsh) than in deeper, fast flowing habitats (leveed river channels).
6. Delta copepods have different food requirements than cladocerans.
7. Detrital energy transmitted through the microbial food web is an important part of the copepod diet.
8. More nutritious producers result in more nutritious copepods as food organisms for fish.
9. Producer polyunsaturated fatty acids predict copepod growth and reproduction.
10. Producer C:P ratios predict copepod growth and reproduction.

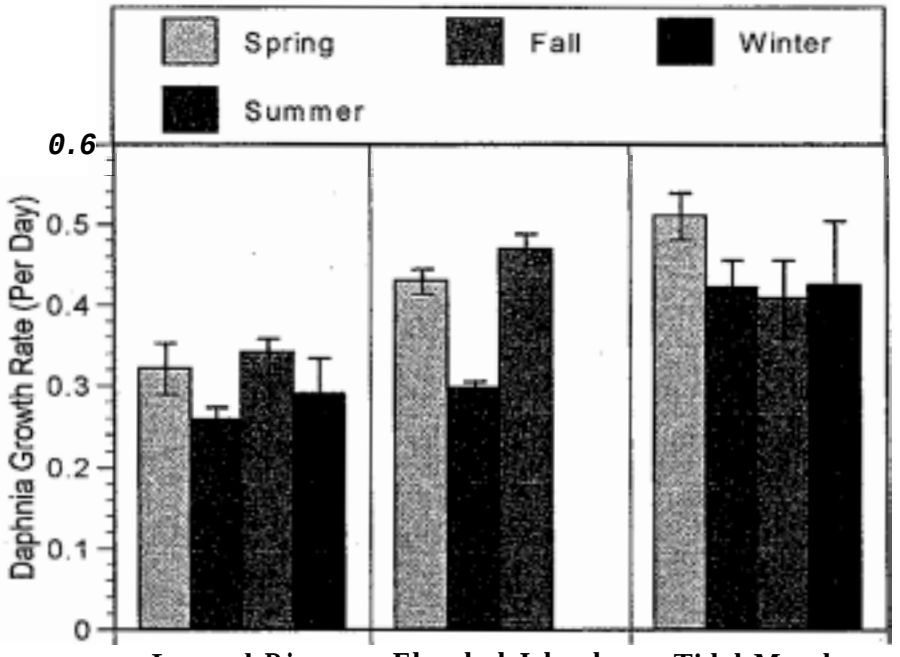
These hypotheses will be tested according to the study plan described below (2 b)).

d) Adaptive management/proposed research:

One possible mechanism for the decline in native and harvestable fishes is that the quantity and quality of their food resources may have become insufficient for successful recruitment [6, 7]. This may be due to decreased habitats suitable for nutritious production and diversion of organic matter away from important rearing habitats [16]. Also important is competition for food resources by introduced species feeding at various trophic levels such as non-native clams competing with zooplankton for algae [20] and exotic fishes competing with native fishes for invertebrate prey [7].

Structural habitat changes such as the decline of shallow water habitats (flood plains, marshes, etc.) may play an important role in the decreased production potential in the Delta. Such habitats are now increasingly targets of restoration and preservation efforts. In a CALFED sponsored study currently in its second year, we showed that shallow water habitats produce more and better food for cladoceran zooplankton ***(Daphnia)*** growth and reproduction than channel sites (Fig. 4), and that ***Daphnia*** require "fresh" algal production rather than imported detrital energy sources for optimal growth in the Delta (Fig. 5).

Figure 4: Seasonal growth rates of ***Daphnia magna*** fed water from different Delta habitats in laboratory growth assays. Leveed River: Sacramento and San Joaquin rivers; Flooded Island: Mildred Island; Tidal Marsh: Suisun and Cut-Off sloughs. (Mueller-Solger, unpublished data).

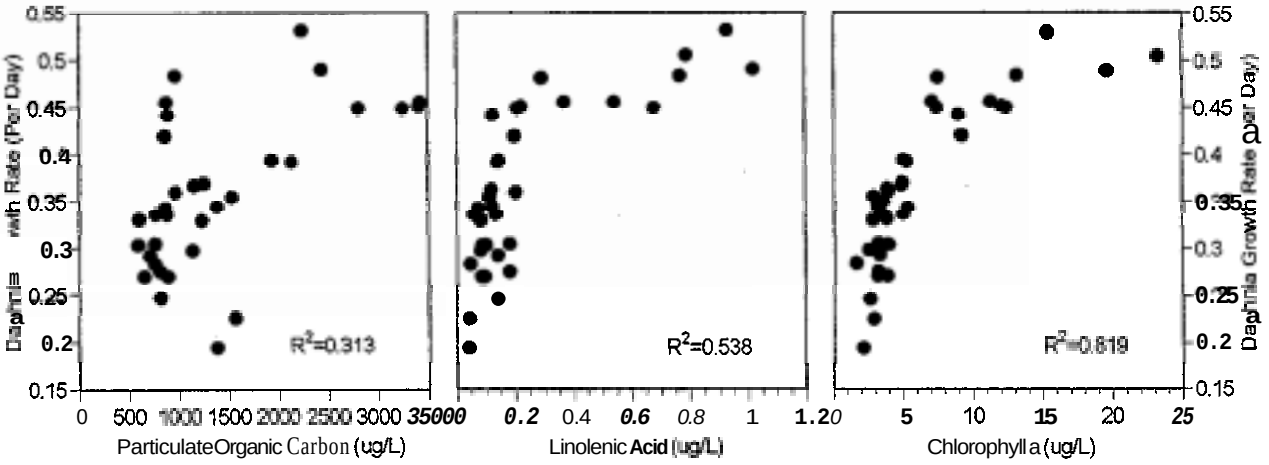


In the study proposed here we will investigate how copepods utilize the food resources available in different Delta habitats and compare our findings to those for cladocerans. Cladocerans and copepods make up the majority of the zooplankton in the Delta and are an important food resource for larval and small planktivorous fish. While cladocera are abundant in spring, copepods dominate the Delta zooplankton community throughout the year [34]. **A** greater understanding about their dietary requirements and if and/or where these requirements are adequately met in the Delta will help guide and monitor the success of restoration efforts.

Furthermore, we will compare the diets and habitat requirements of the formerly very abundant copepods ***Eurytemora affinis*** and ***Cyclops vernalis*** with those of the now dominant exotic

species *Pseudodiaptomusforbesi*, *Sinocalanus doerri* and *Limnooithona sinensis*. *Eurytemora affinis* used to be an important part of the diet of many larval and zooplanktivorous fish species such as delta smelt and young striped bass. While the exotic copepods are also eaten by these fish species, they appear to be a less optimal diet [7, 30].

Figure 5: Relationship between growth rates of *Daphnia magna* and potential food resources: particulate organic carbon (*i.e.*, all potentially edible food), linolenic acid (an essential fatty acid most common in green algae), and chlorophyll *a* (indicating "fresh" algal biomass) measured in seston collected from different Delta habitats and fed to *Daphnia* in laboratory growth assays. (Mueller-Solger, unpublished data).



Finally, we will analyze historic zooplankton and phytoplankton compiled by IEP for relationships between phytoplankton food quality and zooplankton abundances. Monthly phytoplankton data are available since 1975 at various sites in the Delta. Based on taxon-specific essential fatty acid composition, size, shape, and – in a few cases – toxicity, the nutritional value of the phytoplankton community can be estimated for any sampling date. It is thus possible to develop a time series of food value that takes into account quality as well as biomass of the phytoplankton community. Unfortunately, historical time series of zooplankton egg abundance do not exist to assess whether nutritional quality is driving zooplankton growth rate. We can, however, compare seasonal rates of zooplankton biomass change from year to year with phytoplankton food availability.

While we do not propose a specific restoration project, the results of our study will directly benefit restoration and preservation objectives in the Delta (see D). We will carry out our investigation in sites with ongoing restoration and preservation efforts or in sites representative of restoration outcomes (*e.g.*, flooded islands), as well as in unrestored reference sites. This will enable us to evaluate which restoration efforts are most likely to succeed in creating situations where energy and nutrients are channeled toward organisms that we want to benefit (nutritious primary producers, native zooplankton, native fishes) and away from undesirable organisms (non-native species, pest algae of low food quality). **As** stated by CALFED, "the key to successful ecosystem restoration is learning from all management and restoration actions" (PSP 2000, p. 18). We will specifically investigate how water residence time and habitat configurations influence food quality and quantity for copepods in the Delta. We expect managers of restoration projects to adapt their management strategies based on information gained in our study.

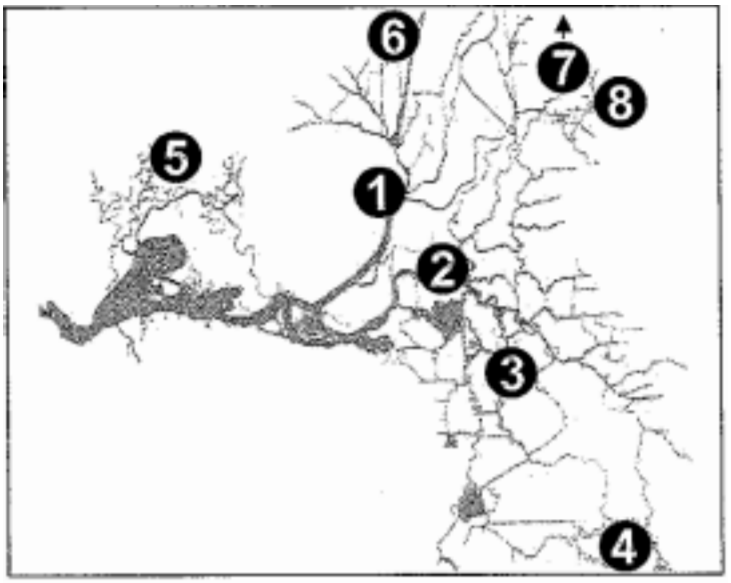
e) *Educational* ***objectives:***

The proposed study will be carried out at UC Davis, a public university. **As** with all our ongoing studies, we expect undergraduate and graduate students to participate and intend to attract interns from local high schools. The experimental **part** of our study will be the basis for a graduate student thesis. We also intend to present our study to students in the form of lectures and field trips during the UCD limnology course and special seminars, **as** well as in a web site.

2. Proposed Scope of Work

a) *Location:*

Figure ***6:*** Sampling site locations and descriptions.



Site	Habitat Type	Site Characteristics
Monitoring Sites:		
❶ Sacramento at Rio Vista	Large tidal river (leveed channel)	Integrator site for Sacramento Watershed
❷ San Joaquin at Twitchell Island	Large tidal river (leveed channel)	Integrator site for San Joaquin Watershed
❸ Mildred Island	Tidal "lake"	Flooded island indicator site
❹ Paradise Cut	Shallow channel, long residence time, eutrophic	Shallow channel indicator site
❺ Suisun Slough and Cutoff Slough	Fresh/brackish tidal marsh	Tidal marsh/slough indicator sites
Sites sampled during inundated periods in late winter and early spring:		
❻ Yolo Bypass, several sites	Large agricultural floodplain with regulated flows	Regulated floodplain indicator sites
❼ Sacramento at Sherwood Harbor	Large tidal river (leveed channel)	Control site upstream of confluence with Yolo Bypass
❽ Cosumnes floodplains, several sites	Smaller, more natural floodplain with unregulated flows	Unregulated floodplain indicator sites

We will regularly (at least once per season and/or flow condition) sample and carry out experiments in the sites shown in Fig. 6, all of which are located in or very near the CALFED Ecological Zones **1** and 2 with the geographical center at approximately 38° 03.660 N and 121° 35.549 W. These sites have been chosen to represent a range of habitats including constricted wide and narrow channels, tidal marsh habitats, flooded islands, and flood plains with regulated and unregulated flooding regimes. These sites have also been chosen because they are targeted by other research projects. We plan to tightly coordinate our study with other research projects such as the ongoing flooded island research (UW and DWR), mercury and selenium research (UCD and USGS), research in the Cosumnes watershed (UCD) and in the Yolo Bypass (DWR) as well as with our own already existing CALFED sponsored project. Additional sites will be added wherever ongoing and newly funded restoration projects provide opportunities to gain greater insight into management effects on food availability for zooplankton. Most sites are within CALFED ecological zones 1 and 2, with few sites in adjacent zones.

b) *Approach:*

Following is a list of tasks. Indicated in parentheses behind the task number are the hypotheses tested in this task.

➲ *Tusk I* (Tests hypothesis 6): Establish and maintain copepod cultures.

This task is to develop culturing protocols and establish a culture system for several species **of** copepods isolated from the Delta (*Eurytemora affinis, Pseudodiaptomusforbesi,* and possibly a cyclopoid copepod). In the past we have successfully isolated and cultured various cladoceran species, including the first exotic cladoceran documented for the Delta *(Daphnialumholtzi).* We are well versed in the use of continuous and batch cultures of both algae and zooplankton.

Copepod cultures are necessary to carry out the experiments described below. Currently there are no available Delta copepod cultures. Successful culturing necessitates knowledge about their dietary requirements and growth conditions (temperature, light, etc.). Experimenting with different diets and culture conditions will thus provide insight into optimal diets and growth conditions for these copepods. Once established, these cultures will provide animals for the experiments described below. Furthermore, we intend to make our cultures available to other researchers. For example, researchers trying to raise Delta Smelt are very interested in obtaining such cultures.

➲ *Tusk* 2 (Tests all hypotheses): Field sampling.

i) Site characteristics: At all sites we will measure temperature, dissolved oxygen, conductivity, turbidity, and Secchi depth. We will note weather, tide and flow conditions.

ii) Seston measurements: In the sites described above we will measure the following seston characteristics in seston collected from different depths with a Van Dom sampler and concentrated on appropriate filters or by sedimentation: Particulate organic carbon (POC) using an elemental analyzer; carbon:nitrogen (C:N) and carbon:phosphorus (C:P) ratios using an elemental analzer and ashing and acid digestion [39]; polyunsaturated fatty acids (PUFAs) with extraction and methylation of samples following a method modified from Kattner and Fricke [19]; chlorophyll *a* and pheophytin *a* using the fluorometric method with acid correction for degradation products [27]; carbon and nitrogen isotopic ratios determined in the UCD stable isotope facility (http://stableisotopefacility.ucdavis.edu.); and phytoplankton and microzooplankton (protozoa, nauplii, and rotifers) composition by microscopic enumeration. All of these measures have been shown to predict the quantity and quality of copepod food resources and/or to serve as tracers for the carbon sources contributing to the copepod diet [8, 10, 41].

iii) Zooplankton sampling: We will quantitatively and qualitatively sample zooplankton with a Clark-Bumpus sampler and a zooplankton net. We will assess copepod abundances in the different habitats by microscopically enumerating the quantitative samples. Productivity of copepods collected from field sites will be evaluated using the egg ratio method and related to the measured seston and environmental parameters to assess their requirements for optimal growth [17]. Also, copepods will be analyzed for stable isotope and fatty acid signatures. Many fatty acids are specific to certain algal and microbial organisms [4, 26]. Fatty acid and carbon-I3 signatures of producers are conserved in consumers [2, 10, 14]. This will give further insight into their food sources.

- *Task 3* (Tests all hypotheses): Growth and grazing experiments.

i) Laboratory growth and egg production bioassays: We will adapt bioassay techniques used by our research group in nutritional studies of cladocerans [32, 33] and others in nutritional studies of copepods [18, 22] to allow direct growth and egg production measurements of copepods fed natural diets from different delta sites and laboratory-grown control diets under controlled temperature and light conditions. Figures 4-5 in this proposal are the results of such assays conducted with *Daphnia magna.*

ii) Field grazing bioassays: We will conduct bioassays in field conditions by incubating natural seston assemblages with and without several different copepod species. At the beginning and end of the experiments we will take subsamples for phytoplankton, microzooplankton and bacteria enumeration as well as for fatty acid and pigment measurements. The differences between the treatments with and without copepods will show their food preferences under natural conditions [9]. Copepod grazing rates can be determined from differences in prey abundances in the beginning and end of the experiment corrected for growth [31].

- *Tusk 4:* Long-term relationships between zooplankton abundances and algal food quality in the Delta (Tests hypotheses 1-5):

We will calculate a food availability index for the phytoplankton community that takes into account taxon-specific chemical composition, size, shape, and other features known to determine suitability as a zooplankton food source. Different indices will be calculated for different zooplankton types (primarily cladocerans versus primary consumer copepods). The indices will be calculated using the CDWR D1485 data set combined with taxa-specific biomass estimates and data from our experiments and the literature on zooplankton food suitability. The resulting time series, extending over 25 years, will be assessed for long-term trends and other important features related to habitat type, water year type, and season. Zooplankton rates of change and biomass will be compared across years by season and site with corresponding estimates of phytoplankton food quality. Where possible, egg ratios from archived samples will be used to assess zooplankton growth rates.

- *Tusk 5*: Synthesis:

Results of this project will be synthesized in reports to CALFED, in oral presentations, and in newsletter and peer-reviewed journal articles using appropriate statistical and modeling techniques. These contributions will convey and make available the products described below.

- *Task 6:* Project management:

Project management will include allocation and management of resources, hiring and management of project staff, acquisition of equipment and supplies, assurance of the timely completion of tasks 1 through 5, establishment of collaborative relationships with other Delta projects including research and restoration projects, assembly of reports, outreach, and other managerial tasks as needed.

c) Monitoring and Assessment Plans: N/A.

d) Data handling & storage

Data will be recorded using custom data sheets. Data QA/QC will involve several stages including error checking of the data sheets at the end of each sampling day by the crew leader, error-checking and data validation in an electronic data base automatically and by data entry personnel, and sorting and/or summarizing of each data field as appropriate. Data will be stored in electronic databases. It will be summarized and made available in presentations, reports, and newsletter articles. It will further be subjected to rigorous peer-review as required for publication in scientific journals.

e) *Products:*

Products of this project will include new theoretical insights: a comprehensive assessment of Delta copepod food requirements and resources including current and long-term trends; identification of nutritionally favorable and unfavorable habitats and seasons for copepods; and an evaluation of the predictive power of nutritional indicators for zooplankton community dynamics.

Products of a more practical and/or applied nature will include: recommendations about the most useful nutritional indicators for copepod growth and reproduction success in the Delta to be measured in monitoring programs; recommendations about restoration efforts that would benefit the production of preferred copepod food resources and by extension the production of at-risk fish and harvestable species; established Delta copepod cultures which will be available for other studies; protocols for bioassays which can be used as ecological indicators of copepod food-limitation within monitoring programs.

Products will be made available as described in *f)* below.

f) Work schedule:

We propose a project start date of January 2001 with project completion in December 2003. We will submit progress reports as required by CALFED as well as present our results at scientific meetings, such as the IEP and the State-of the-Estuary conferences, and in specially arranged seminars and lectures. We will further synthesize our results by preparing newsletter and journal articles as well as a graduate thesis. The timeline for each task described in 2.-b) is summarized in Table **1** in half-year increments.

Table 1: Work schedule by task and year.

Task	Description	Year 1		Year 2		Year 3	
		1	2	1	2	1	2
1	Copepod cultures	X	X	X	X	X	X
2	Develop field sampling protocols	X	X				
2	Conduct field sampling		X	X	X		
2	Laboratory analyses		X	X	X	X	
3	Develop lab bioassay techniques	X	X	X			
3	Conduct lab bioassays			X	X		
3	Conduct field bioassays		X	X	X		
3	Laboratory Analysis		X	X	X	X	
4	Historical data analysis	X	X	X	X	X	X
5	Synthesis - Reports	X	X	X	X	X	X
5	Synthesis - Presentations			X	X	X	X
5	Synthesis - Journal articles				X	X	X
6	Project Management	X	X	X	X	X	X

g) Feasibility

We have extensive experience with the methods discussed and referenced in the project description. The project is a team effort between internationally acclaimed senior investigators with a long history of Bay-Delta and aquatic research and a young investigator pioneering new techniques in assessing energy transfer pathways in food webs. This project will make use of laboratory, office, and computing facilities and logistical and clerical support provided by the Department of Environmental Science and Policy at UC Davis. Sampling will be done from shore or with rented boats (rented from Korth's Pirate's Lair Marina), **or,** whenever possible, coordinated with the IEP compliance monitoring schedule (see support letters in the appendix).

D. APPLICABILITY

The knowledge gained through our study will contribute to the achievement of virtually all stated ERP goals: we will investigate and make recommendations about which ecosystem processes and lower trophic level assemblages (goal 2) will lead to recovery and maintenance of at-risk (goal 1) and harvestable species (goal 3), in which habitats these processes are optimized (goal **4),** how non-native copepod species impact these processes (goal 5), and how these processes could impact water quality and transfer and accumulation of toxicants such as heavy metals in the food web (goal 6). Project managers implementing restoration projects will be able to integrate our insights and recommendations into their adaptive management strategies and monitoring programs. Furthermore, the assays, measurements, and analyses proposed here will extend and complement many Delta and food web projects, including the following (in parentheses: project members providing letters of support, see appendix): our existing CALFED grant (Sobczak), a National Science Foundation supported project on highly unsaturated fatty acids as food quality indicators (Brett), contaminants projects (Slotton, Luoma), flood plain work (Sommer), IEP zooplankton and phytoplankton monitoring (Hymanson, Orsi), The Nature Conservancy projects in the Cosumnes watershed (Swenson) and breached levee projects.

We are currently participating in a large, collaborative research project coordinated by J. Cloern, USGS, which received CALFED Cat. III funding in 1998 for a three-year study entitled "Assessment of the Sacramento-San Joaquin River Delta as Habitat for the Food Resources that Support Fish Recruitment," CALFED Number 98-2015000-00096.

E. QUALIFICATIONS:

Charles Goldman, Professor of Limnology in the Department of Environmental Science and Policy, has been with the University of California, Davis, since 1958. He has supervised 86 graduate students and 30 postdoctorals during his 40 years at UC Davis. Professor Goldman's many prestigious awards include an NSF Senior Postdoctoral Fellowship in 1964 for limnological research in the Arctic (Lapland), a Guggenheim Fellowship in northern Italy in 1965, the "Goldman Glacier" in Antarctica named in 1967, served as President of the American Society of Limnology and Oceanography in 1967-68, awarded the Antarctic Service Medal by Congress in 1968, and elected a Fellow by the California Academy of Sciences in 1969. In 1973-74, he was elected Vice President of the Ecological Society of America, and accepted a Fulbright Distinguished Professorship to Yugoslavia in 1985. He was awarded the Vollenweider Lectureship in Canada in

1989, the Chevron Conservation Award and Culver Man-of-the Year in 1991, the Earle A. Chiles Award in 1992, and the UC Davis Distinguished Public Service & Research Lecturer awards in 1993. He was elected Vice President of the International Society of Limnology (SIL) for 1992-98, and presented the prestigious Baldi Lecture at the triennial SIL Congress in Ireland in August 1998. Dr. Goldman has published four books and over 400 scientific articles, and has produced four documentary films which are in worldwide distribution. He has served on many national and international committees and is frequently sought for consultation and research missions to foreign countries on major environmental problems. His single most important and sustained contribution is the 40 years of research on Lake Tahoe. Professor Goldman is Director of the Tahoe Research Group and has pursued long-term ecological research simultaneously at Lake Tahoe and Castle Lake, California, since 1958. He successfully combined effective research and social action with his pioneering studies of lake eutrophication. These have been directly applied to engineering solutions, social needs, and legal decisions. This work has recently included the development of artificial wetlands and research on alternatives to conventional road salt for deicing highways. This relationship of basic science to political change has been of particular importance to the Lake Tahoe basin. During the summer of 1997, Dr. Goldman hosted President Clinton and Vice President Gore aboard the UC Davis research vessel ***John** Le Conte* during the Lake Tahoe Presidential Forum. Professor Goldman's career work has now been honored with his most prestigious award yet: he received the 1998 Albert Einstein World Award of Science in a formal ceremony last year in New Zealand.

Alan Jassby is a professional research ecologist with the Department of Environmental Science and Policy. He received a Ph.D. in ecology from UC Davis in 1973, and worked as a research scientist at the Bedford Institute of Oceanography in Canada, the Lawrence Berkeley Laboratory, and a private company engaged in mass algal cultivation before returning to UC Davis around 1990. Dr. Jassby's research and consulting centers on limnology and estuarine ecology, including Lake Tahoe and the San Francisco Bay-Delta. He served as a member of the Science Advisory Group for the Interagency Ecological Program in the Bay-Delta, and was awarded the Hugo B. Fischer award in 1995 for his Bay-Delta research. Dr. Jassby is also a consulting professor of civil and environmental engineering at Stanford University; managing director of a nongovernmental organization, The MettaDana Project, which promotes public health and community development in Myanmar; and on the editorial board of the Aquatic Ecosystem Health and Management Journal. He has extensive experience with analysis of long-term data sets, including those for the Bay-Delta.

Anke Mueller-Solger is a postdoctoral scholar in the Department of Environmental Science and Policy at UCD. She will assume responsibility for tasks 1, 2, 3, and ***6.*** Dr. Mueller-Solger received a Ph.D. in Ecology from UCD in 1998 for work on links between the classical and the microbial components of aquatic food webs in lakes. She has also acted as manager and director of the UCD Castle Lake limnological field station since 1993. In 1998, she was awarded the UC Davis Outstanding Graduate Student Teaching Award. Her current postdoctoral work includes an investigation of food quantity and quality for cladocerans in the Delta as part of the CALFED project 98-2015000-00096 research team as well as newer collaborations with researchers working in the Cosumnes and Yolo Bypass flood plains. She is also experienced in budget and personnel management and training and supervision of students and technicians.

F. COST:

Budget: see attached table.

Use of budget items:

Salary:

Dr. Charles R. Goldman will not require any salary through this project.
Dr. Alan Jassby, research scientist. Benefits 17% of salary.
Dr. Anke Mueller-Solger, postdoctoral researcher. Benefits 17% **of** salary.
Technician. Benefits 17% of salary.
Graduate student. No benefits. Fee remission: 26% **of** salary.
Undergraduate assistant. Benefits: 1.2% of salary.

Equipment:

Ultralow Freezer for storage of samples for fatty acid analysis; Freeze Drier for preparation of fatty acid samples, clean bench for sterile culture and sample handling, computer.

Supplies:

Sampling supplies, chemicals, glassware, analytical supplies, office supplies.

Travel:

Boat, car, and air travel to sampling sites and relevant meetings.

Service Contracts:

The Hewlett-Packard gas chromatograph used for fatty acid analysis requires regular professional service to ensure quality of data.

Overhead:

University of California operating expenses including cost of administering this grant.

G. LOCAL INVOLVEMENT

As with our currently existing projects, we will regularly organize and give seminars and lectures, involve student interns ranging from high school to college students, arrange for sampling and lab tours for students and the general public, and give press interviews to educate the public about our research. Local groups such as the Nature Conservancy and various agencies are interested in and support our research program as evidenced by the attached support letters. Interaction with these groups and agencies is ongoing.

H. COMPLIANCE WITH STANDARD TERMS AND CONDITIONS

For exceptions to compliance with the standard terms and conditions contained in PSP Attachments D and E please see attached cover letter. The applicant will comply with all remaining terms and conditions.

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Budget

Year	Task	Direct Labor Hours	Salary	Benefits	Travel*	Supplies & Expendables	Service Contracts**	Overhead (26%)	Exempt from Overhead Equipment***	Student Fee Remission	Total Cost
Year 1	1. Establish copepod cultures					$3,000		$780	$10,000		$13,780
	A. Muelier-Solger, 2 molyr	320	$6,164	$1,048				$1,875			$9,087
	Technician, 4 molyr	640	$10,324	$1,755				$3,141			$15,220
	2. Field sampling				$2,000	$4,000		$1,560	$5,000		$12,560
	A. Mueiler-Soiger, 2 molyr	320	$6,164	$1,048				$1,675			$9,087
	Technician, 6 molyr	960	$15,486	$2,633				$4,711			$22,829
	Undergraduate assistant, 4 mol)	640	$3,680	$45				$969			$4,694
	3. Experiments					$2,000	$2,000	$1,040	$15,000		$20,040
	A. Mueiler-Solger, 3 molyr	480	$9,246	$1,572				$2,813			$13.6: 0
	Technician, 2 molyr	320	$5,162	$878				$1,570			$7,610
	Graduate student, 7.25 molyr	1160	$16,661					$4,332		$4,31	$25,306
	4. Historical data analysis				$500	$500		$260	$5,000		$8,260
	A. Jassby, 3 molyr	480	$16,975	$2.866				$5,164			$25,025
	5. Synthesis							$0			$0
	A. Jassby, 1 molyr	160	$5,658	$962				$1,721			$8,342
	A. Mueller-Solger, 1 molyr	160	$3,062	$524				$938			$4.513
	6. Project Management					$500		$130			$6: 0
	A. Mueller-Solger. 2 molyr	320	$6,164	$1,048				$1,875			$9,087
otal	Cost Year 1		$104,766	$14,397	$2,500	$10,000	$2,000	$34,752	$35,000	$4,31	$207.7: 0

Year	Task	Direct Labor Hours	Salary	Benefits	Travel"	Supplies & Expendables	Service Contracts**	Overhead (26%)	Exempt from Overhead Equipment***	Exempt from Overhead Student Fee Remission	Total Cost
Year 2	1. Maintain copepod cultures										$0
	Technician, 2 molyr	320	$5,265	$895				$1,602			$7,762
	2. Field sampling				$2,000	$5.000		$1.820			$8,820
	A. Mueller-Solger. 4 molyr	640	$12,575	$2.138				$3.825			$18,537
	Technician, 6 molyr	960	$15,796	$2.685				$4,805			$23,286
	Undergraduate assistant, 4 moly	640	$3.754	$46				$988			$4,787
	3. Experiments				$2,000	$6,000	$2,000	$2,600			$12,600
	A. Mueiler-Solger, 3 molyr	480	$9,431	$1,603				$2,869			$13,903
	Technician, 4 molyr	640	$10,530	$1,790				$3,203			$15,524
	Graduate student, 7.25 molyr	1160	$16.994					$4,418		$4,501	$25,912
	4. Historical data analysis				$500	$500		$260			$1,260
	A. Jassby, 3 molyr	480	$17,314	$2,943				$5,267			$25,525
	5. Synthesis					$500		$130			$630
	A. Jassby, 1 molyr	160	$5.771	$981				$1,756			$8.508
	A. Mueiler-Solger, 2 mo/yr	320	86,287	$1.069				$1,913			$9,269
	6. Project Management					$500		$130			$630
	A. Mueiler-Solger, 2 molyr	320	$6,287	$1,069				$1,913			$9,269
Total Cost Year 2			$110.005	$15,220	$4,500	112,500	$2,000	$37,488	$0	$4,50(	$186,223

Year	Task	Direct Labor Hours	Salary	Benefits	Travel*	Supplies & Expendables	Service Contracts**	Overhead (26%)	Exempt from Overhead Equipment***	Student Fee Remissio	Total Cost
Year 3	1. Maintain copepod cultures					$2,000		$520			$2,520
	Technician, 2 molyr	320	$5.371	$913				$1,634			$7,917
	2. Field sampling					$2,000		$520			$2,520
	A. Mueller-Solger, 1 mo/yr	160	$3,207	$545				$975			$4,727
	Technician, 4 mo/yr	640	$10,741	$1.826				$3.267			$15,835
	3. Experiments				$1,000	$4,000	$2,000	$1,820			$8,820
	A. Muelier-Solger. 1 molyr	160	$3,207	$545				$975			$4,727
	Technician, 2 molyr	320	$5,371	$913				$1,634			$7,917
	Graduate student, 2 molyr	320	$4,782					$1,243		$1.60	$7,625
	4. Historical data analysis							$0			$0
	A. Jassby, 1 molyr	160	$5,887	$1,001				$1,791			$8,679
	5. Synthesis				$2,000	$500		$650			$3,150
	A. Jassby, 3 molyr	480	$17,660.78	$3,002.33				$5,372			$26,036
	A. Mueiier-Soiger, 8 molyr	1280	$25,652	$4,361				$7.803			$37,816
	Graduate student, 5.25 mo/yr	840	$11,954					$3,108		$3,20	$18,262
	Technician, 4 molyr	640	$10,741	$1,826				$3,267			$15,835
	6. Project Management					$500		$130			$630
	A. Mueller-Soiger, 2 mo/yr	320	$6,413	$1,090				$1,9511			$9,454
otal	Cost Year 3		$110,985	$16,022	$3,000	$9,000	$2,000	$36,662	$0	$4,80	$182,469
otal Project Cost			**$325,756**	**$45,639**	**$10,000**	**$31,500**	**$6,000**	**$108,913**	**$35,000**	**$13,61**	***$576,422***

* Travel: includes boat, car, and airplane travel to sampling sites and relevant meetings
**Service Contract: For Hewiett Packard Gas Chromatograph
*** Equipment: PCs, ultralow freezer, freeze drier, clean bench

APPLICATION FOR FEDERAL ASSISTANCE

OMB Approval No. 0348-0043

2. DATE SUBMITTED	Applicant Identifier
3. DATE RECENED BY STATE	Slate Application Identifier
4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier

1. TYPE OF SUBMISSION:
Application: ☐ Construction ☒ Non-Construction
Preapplication: ☐ Construction ☐ Non-Construction

5. APPLICANT INFORMATION

Legal Name: THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, U.C. DAVIS Campus

Organizational Unit: University of California, Davis Campus

Address (give city, county, State, and zip code): Office of the Vice Chancellor-Research 410 Mrak Hall, University of California Davis, California 95616 (Yolo County)

Name and telephone number of person to be contacted on matters involving this application (give area code)
P.I.: Charles Goldman (530)752-1557
Admin.: Sandra Dowdy (530)752-2075

6. EMPLOYER IDENTIFICATION NUMBER (EIN): 94-6036494

7. TYPE OF APPLICANT (enter appropriate letter in box) I

A. State
B. County
C. Municipal
D. Township
E. Interstate
F. Intermunicipal
G. Special District
H. Independent School Dist.
I. State Controlled Institution of Higher Learning
J. Private University
K. Indian Tribe
L. Individual
M. Profit Organization
N. Other (Specify)

8. TYPE OF APPLICATION:
☐ New ☐ Continuation ☐ Revision
If Revision, enter appropriate letter(s) in box(es) ☐ ☐
A. Increase Award B. Decrease Award C. Increase Duration
D. Decrease Duration Other (specify):

9. NAME OF FEDERAL AGENCY
CALFED Bay-Delta Program

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER
N/A
TITLE:

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT
Food Resources for Zooplankton in the Sacramento-San Joaquin River Delta

12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.):
Sacramento-San Joaquin Bay-Delta

13. PROPOSED PROJECT
Start Date: 1/01/01
Ending Date: 12/31/03

14. CONGRESSIONAL DISTRICTS OF
a. Applicant: 111 (California)
b. Project: (California: 3,5,7,10,11)

15. ESTIMATED FUNDING

a. Federal	$ 576,422 .00
b. Applicant	$ .00
c. State	$ .00
d. Local	$ .00
e. Other	$ .00
f. Program Income	$ .00
g. TOTAL	$ 576.422 .00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTNE ORDER 12372 PROCESS?
a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON
DATE
b. No. ☒ PROGRAM IS NOT COVERED BY E. 0.12372
☐ OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?
☐ Yes If "Yes," attach an explanation. ☒ No

18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORUED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.

a. Type Name of Authorized Representative	b. Title	c. Telephone Number
Sandra M. Dowdy	Contracts and Grants Analyst	
d. Signature of Authorized Representative: Sandra M. Dowdy	e. Date Signed: MAY 12 2000	

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Standard Form 424 (Rev. 7-97)
Prescribed by OMB Circular A-102

BUDGET INFORMATION- Non-Construction Programs

OM0 Approval No. 0348-0044

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (t)	Total (g)
1. TASKS 1 & 3		$	$	$ 223,101	$	$ 223,101
2. TASK 2				127,682		127,682
3. TASKS 4 & 5				195,939		195,939
4. TASK 6				29,700		29,700
5. Totals		$	$	$ 576,422	$	$ 576,422

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1) TASKS 1 & 3	(2) TASK 2	(3) TASKS 4 & 5	(4) TASK 6	Total (5)
a. Personnel	$ 108,506	$ 71,401	$ 126,984	$ 18,864	$ 325,756
b. Fringe Benefits	11,912	10,966	19,555	3,207	45,639
c. Travel	3,000	4,000	3,000	0	10,000
d. Equipment	25,000	5,000	5,000	0	35,000
e. Supplies	17,000	11,000	2,000	1,500	31,500
f. Contractual					0
g. Construction					0
h. Other (fee remission, service contracts)	19,614	0	0	0	19,614
i. Total Direct Charges *(sum of 6a-6h)*	185,032	102,367	156,539	23,571	467,509
j. Indirect Charges	38,069	25,315	39,400	6,129	108,913
k. TOTALS *(sum of 6i and 6j)*	$ 223,101	$ 127,682	$ 195,939	$ 29,700	$ 576,422
7. Program Income	$	$	$	$	$

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Prescribed by OMB Circular A-102

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SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
8.	$	$	$	$
9.				
10.				
11.				
12. TOTAL *(sum of lines 8-11)*	$	$	$	$

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 207,730	$ 51,932.50	$ 51,932.50	$ 51,932.50	$ 51,932.50
14. Non-Federal					
15. TOTAL *(sum of lines 13 and 14)*	$ 207,730	$ 51,932.50	$ 51,932.50	$ 51,932.50	$ 51,932.50

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (Years)			
	(b) First	(c) Second	(d) Third	(e) Fourth
16.	$ 186,223	$ 182,469	$	$
17.				
18.				
19.				
20. TOTAL *(sum of lines 16-19)*	$ 186,223	$ 182,469	$	$

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges:

22. Indirect Charges:
26.0% of Modified Total Direct Charges

23. Remarks:

OMB Approval No. 0348-0040

ASSURANCES - NON-CONSTRUCTION PROGRAMS

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions. please contact the awarding agency. Further. certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.

2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §3601 et seq.), as amended, relating to nondiscrimination in the sale. rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.

10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. 551271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties). and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).

14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.

15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.

16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 554801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.

17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, 'Audits of States, Local Governments. and Non-Profit Organizations.'

18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

>NATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
Sandra M Dowdy	Sandra M. Dowdy Contracts and Grants Analyst
PLICANT ORGANIZATION THE REGENTS OF THE UNIVERSITY OF CALIFORNIA	DATE SUBMITTED MAY 12 2000

Standard Form 424B (Rev. 7-97) Back

U.S. Department of the Interior

Certifications Regarding Debarment, Suspension and Other Responsibility Matters, Drug-Free Workplace Requirements and Lobbying

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - The prospective primary participant further agrees by submitting this proposal that it will include the clause titled, "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions. See below for language to be used; use this form for certification and sign: or use Department of the Interior Form 1954 (DI-1954). (See Appendix A of Subpart D of 43 CFR Part 12.)

Certification Regarding Debarment. Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of 43 CFR Part 12.)

Certification Regarding Drug-Free Workplace Requirements'- Alternate I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals) - (See Appendix C of Subpart D of 43 CFR Part 12.)

Signature on this form provides for compliance with certification requirements under 43 CFR Parts 12 and 18. The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction. grant, cooperative agreement or loan.

PART A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

CHECK — IF THIS CERTIFICATION IS FOR A PRIMARY COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction: violation of Federal or State antitrust statutes or commission of embezzlement, theft. forgery. bribery. falsification or destruction of records, making false statements. or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification: and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification. such prospective participant shall attach an explanation to this proposal.

PART B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

CHECK __ IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred. suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification. such prospective participant shall attach an explanation to this proposal.

DI-2010
March 1995
(This form consolidates DI-1953. DI-1954, DI-1955. DI-1956 and DI-1963)

PART C: Certification Regarding Drug-Free Workplace Requirements

CHECK __ IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS NOT AN INDIVIDUAL

Alternate I. (Grantees Other Than Individuals)

A. The grantee certifies that it will or continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about–
(1) The dangers of drug abuse in the workplace;
(2) The grantee's policy of maintaining a drug-free workplace;
(3) Any available drug counseling. rehabilitation, and employee assistance programs; and
(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will –
(1) Abide by the terms of the statement; and
(2) Notify the employer in writing of tis or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(e) Notifying the agency in writing, within ten calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice. including position title, to every grant officer on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted –
(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973. as amended; or
(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c). (d). (e) and (f).

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county. state, zip code)

DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY
1 SHIELDS AVENUE, U. C. DAVIS
DAVIS, CA 95616

Check __ if there are workplaces on file that are not identified here.

PART D Certification Regarding Drug-Free Workplace Requirements

CHECK __ IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS AN INDIVIDUAL.

Alternate II. (Grantees Who Are Individuals)

(a) The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession. or use of a controlled substance in conducting any activity with the grant:

(b) If convicted of a criminal drug offense resulting from a violation occurring during the conduct of any grant activity, he or she will report the conviction, in writing, within 10 calendar days of the conviction, to the grant officer or other designee, unless the Federal agency designates a central point for the receipt of such notices. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

PARTE: Certification Regarding Lobbying
Certification for Contracts, Grants, Loans, and Cooperative Agreements

CHECK __ IF CERTIFICATION IS FOR THE AWARD OF ANY OF THE FOLLOWING AND THE AMOUNT EXCEEDS $100,000: A FEDERAL GRANT OR COOPERATIVE AGREEMENT, SUBCONTRACT, OR SUBGRANT UNDER THE GRANTOR COOPERATIVE AGREEMENT.

CHECK __ IF CERTIFICATION IS FOR THE AWARD OF A FEDERAL LOAN EXCEEDING THE AMOUNT OF $150,000, OR A SUBGRANJOR SUBCONTRACTEXCEEDING $100,000, UNDER THE LOAN.

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by *or* on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract. the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal. amendment, or modification of any Federal contract, grant, loan, *or* cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant. loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL. "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

As the authorized certifying official, I hereby certify that the above specified certifications are true.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL Sandra M. Dowdy

TYPED NAME AND TITLE Sandra M. Dowdy
Contracts and Grants Analyst

DATE MAY 12 2009

DI-2010

March 1995

(This form consolidates DI-1953, DI-1954, DI-1955. DI-1956 and DI-1963)

Environmental Compliance Checklist

All applicants must fill out this Environmental Compliance Checklist. Applications must contain answers to the following questions to **be** responsive and to be considered for funding ***Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.***

1. **Do** any of the actions included in the proposal require compliance with either the California Environmental Quality Act (CEQA), the National Environmental Policy Act (NEPA), **or** both?

_____	X
YES	NO

2. If you answered yes to # **1,** identify the lead governmental agency for CEQA/NEPA compliance.

_____
Lead Agency

3. If you answered no to # 1, explain why CEQA/NEPA compliance is not required for the actions in the proposal.

No environmental impacts as **defined** by **CEQA/NEPA.**

4. **If** CEQA/NEPA compliance is required, describe how the project **will** comply with either or both of these laws. Describe where the project is in the compliance process and the expected date of completion.

5. Will the applicant require access across pnhlic **or** private property that the applicant does not own to accomplish the activities in the proposal?

_____	X
YES	NO

If yes, the applicant must attach written permission for access from the relevant property owner(s). Failure to include written permission **for** access may result in disqualification of the proposal during the review process. Research and monitoring field projects for which specific field locations have not been identified will be required to provide access needs and permission **for** access with **30** days of notification of approval.

6. Please indicate what permits **or** other approvals may be required for the activities contained in your proposal. Check all **boxes** that apply.

LOCAL		
Conditional use permit	___	
Variance	___	
Snbdivision Map Act approval	___	
Grading permit	___	
General plan amendment	___	
Specific plan approval	___	
Rezone		___
Williamson Act Contract cancellation	___	
Other _____ (please specify)		
None required	x	
STATE		
CESA Comnliance	___	**(CDFG)**
Streambed alteration pennit	___	(CDFG)
CWA § **401** certification	___	(RWQCB)
Coastal development permit	___	(Coastal Commission/BCDC)
Reclamation Board approval	___	
Notification	___	(DPC, BCDC)
Other _____ @leasespecify)		
None required	x	
FEDERAL		
ESA Consultation	___	**(USFWS)**
Riven & Harbors Act pennit	___	(ACOE)
CWA § **404** permit	___	(ACOE)
Other _____ @leasespecify)		
None required	x	

DPC = Delta Protection Commission
CWA = Clean Water Act
CESA = California Endangered **Species** Act
USFWS = U.S. Fish and Wildlife Service
ACOE = U.S. Army Corps of Engineers

ESA = Endangered **Species** Act
CDFG = California Department of Fish and Game
RWQCB = Regional Water Quality Control Board
BCDC= Bay Conservation and Development Comm.

Land Use Checklist

All applicants must **fill** out this Land Use Checklist for their proposal. Applications must contain answers to the following questions to be responsive and to be considered for funding. ***Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.***

1. **Do** the actions in the proposal involve physical changes to the land (i.e. grading, planting vegetation, **or** breeching levees) **or** restrictions **in** land use (i.e. conservation easement **or** placement of land in a wildlife refuge)?

YES _____ **NO** X

2. If **NO** to # **1,** explain what type of actions are involved in the proposal (i.e., research only, planning only).

Research only.

3. If YES to # **1,** what is the proposed land **use** change **or** restriction under the proposal?

4. If **YES** to # 1, is the land currently under a Williamson Act **contract?**

YES _____ **NO** _____

5. If **YES** to # **1,** answer the following:

Current land use _____
Current wning _____
Current general plan designation _____

6. If **YES** to **#1,** is the land classified as Prime Farmland, Farmland of Statewide Importance **or** Unique Farmland on the Department of Conservation Important Farmland Maps?

YES _____ **NO** _____ **DON'T KNOW** _____

7. If YES to # **1,** how many acres of land will be subject to physical change **or** land use restrictions under the proposal?

_____

8. If YES to # 1, is the property currently being commercially fanned **or** grazed?

YES _____ **NO** _____

9. If **YES** to **#8,** what are the number of employees/acre_____
the total number of employees _____

10. Will the applicant acquire any interest in land under the proposal **(fez** title **or** a conservation easement)?

YES	NO
_____	X

11. What entity/organization **will** hold the interest?_____

12. If **YES** to # **10,** answer the following:

Total number **of** acres to be acquired under proposal _____
Number ***of*** acres to be acquired in fee _____
Number **of** acres **to** be subject **to** conservation easement _____

13. For all proposals involving physical changes to the land **or** restriction in land use, describe what entity **or** organintion **will:**

manage the properly _____

provide operations and maintenance services _____

conduct monitoring _____

14. For land acquisitions *(fee* title **or** easements), **will** existing water rights also be acquired?

YES	NO
_____	_____

15. Does the applicant propose any modifications to the water right **or** change in the delivery ***of*** the water?

YES	NO
_____	X

16. If YES to # **15,** describe_____

NONDISCRIMINATION COMPLIANCE STATEMENT

STD. 19 (REV. 3-95)

UNIVERSITY OF CALIFORNIA, DAVIS

COMPANY NAME

The company named above (herinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment againstany employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, physical disability (including HIV and AIDS), medical condition (cancer), age (over 40), marital status, denial of family care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I amfully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of rhe State of California.

OFFICIAL'S NAME: THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

DATE EXECUTED: MAY 12 2006

EXECUTED IN THE COUNTY OF: YOLO

PROSPECTIVE CONTRACTOR'S SIGNATURE: Sandra M. Dowdy

PROSPECTIVE CONTRACTOR'S TITLE: Sandra M. Dowdy
Contracts and Grants Analyst

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

UNIVERSITY OF CALIFORNIA, DAVIS

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY
Anke Mueller-Solger
(530)752-2913

ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-8576

May 12,2000

Yolo County Planning and Public Works Department
292 West Beamer Street
Woodland, CA 95695

Dear Sir or Madam:,

This letter is to notify you that the University of California, Davis, is submitting a proposal to CALFED entitled 'Food resources for zooplankton in the Sacramento-San Joaquin River Delta'. CALFED has requested that all investigators submitting proposals to CALFED notify the Board of Supervisors and Planning Departments in counties in which work will be conducted. This letter serves to provide that notification.

The proposed project is a collaborative effort among investigators at the University of California, with sampling assistance provided by the California Department of Water Resources. Our project is designed to assess the nutritional requirements of Delta copepods, which habitats meet these requirements, and how Delta food quantity and quality for copepods has changed over time. We will characterize and quantify energy transfer pathways and efficiencies from producers via copepods to fish. These ecosystem functions are central to success and failure of restoration projects as well as to an increased understanding of biotic contaminant transfers. Our goal is to provide the scientific basis for guiding and evaluating Delta management and restoration. Algae and invertebrate samples will be collected for a two year period at 8 sites in the Sacramento-San Joaquin Delta in coordination with the Department of Water Resource's regularly scheduled monthly monitoring program, its Yolo Bypass study, and a UCD Cosumnes river study.

CALFED will make the funding decisions later this year, and if our study is funded, work will be performed from January 2001 through December 2002. If you have any questions please call me at 530-752-2913.

Sincerely,

Anke Mueller-Solger /
Project Manager, Postdoctoral Research Scientist

UNIVERSITY OF CALIFORNIA, DAVIS

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DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY
Anke Mueller-Solger
(530)752-2913

ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-8576

May 12,2000

T.W. Hutchings
Planning and Community Development
827 7th Street, Room 230
Sacramento **CA** 95814

Dear Mr. Hutchings,

This letter is to notify you that the University of California, Davis, is submitting a proposal to CALFED entitled 'Food resources for zooplankton in the Sacramento-San Joaquin River Delta'. CALFED has requested that all investigators submitting proposals to CALFED notify the Board of Supervisors and Planning Departments in counties in which work will be conducted. This letter serves to provide that notification.

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Project Manager, Postdoctoral Research Scientist

UNIVERSITY OF CALIFORNIA, DAVIS

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DEPARTMENT OF ENVIRONMENTAL **SCIENCE** AND **POLICY**
Anke Mueller-Solger
(530)752-2913

ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-8576

May 12,2000

Cindy H. Turner
Clerk of the Board
County Board of Supervisors
700 H Street, Suite 2450
Sacramento CA 95814

Dear Ms. Turner,

This letter is to notify you that the University of California, Davis, is submitting a proposal to CALFED entitled 'Food resources for zooplankton in the Sacramento-San Joaquin River Delta'. CALFED has requested that all investigators submitting proposals to CALFED notify the Board of Supervisors and Planning Departments in counties in which work will be conducted. This letter serves to provide that notification.

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Project Manager, Postdoctoral Research Scientist

UNIVERSITY OF CALIFORNIA, DAVIS

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DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY
Anke Mueller-Solger
(530)752-2913

ONE SHIELDS AVENUE
DAVIS. CALIFORNIA 95616-8576

May 12,2000

Ms Lois Sahyoun
Clerk of the Board
County Board of Supervisors
Courthouse, Room 701
222 East Weber Ave
Stockton CA 95202

Dear Ms. Sahyoun,

This letter is to notify you that the University of California, Davis, is submitting a proposal to CALFED entitled 'Food resources for zooplankton in the Sacramento-San Joaquin River Delta'. CALFED has requested that all investigators submitting proposals to CALFED notify the Board of Supervisors and Planning Departments in counties in which work will be conducted. This letter serves to provide that notification.

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Sincerely,

Anke Mueller-Solger
Project Manager, Postdoctoral Research Scientist

UNIVERSITY OF CALIFORNIA, DAVIS

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DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY

ONE SHIELDS AVENUE
DAVIS. CALIFORNIA 95616-8576

Anke Mueller-Solger
(530)752-2913

May 12,2000

Mr. Ben Hulst
Community Development Department
Planning Division
1810 E. Hazelton
Stockton CA 95205

Dear Mr. Hulst,

This letter is to notify you that the University of California, Davis, is submitting a proposal to CALFED entitled 'Food resources for zooplankton in the Sacramento-San Joaquin River Delta'. CALFED has requested that all investigators submitting proposals to CALFED notify the Board of Supervisors and Planning Departments in counties in which work will be conducted. This letter serves to provide that notification.

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Sincerely,

Anke Mueller-Solger
Project Manager, Postdoctoral Research Scientist

UNIVERSITY OF CALIFORNIA, DAVIS

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DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POUCY

ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-8576

Anke Mueller-Solger
(530)752-2913

May 12,2000

Office of the County Board of Supervisors
attn: D. Gerber (Chair)
615 Pine Street
Martinez CA 94553

Dear Mr. Gerber,

This letter is to notify you that the University of California, Davis, is submitting a proposal to CALFED entitled 'Food resources for zooplankton in the Sacramento-San Joaquin River Delta'. CALFED has requested that all investigators submitting proposals to CALFED notify the Board of Supervisors and Planning Departments in counties in which work will be conducted. This letter serves to provide that notification.

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Project Manager, Postdoctoral Research Scientist

UNIVERSITY OF CALIFORNIA, DAVIS

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DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY

ONE SHIELDS AVENUE
DAVIS. CALIFORNIA 95616-8576

Anke Mueller-Solger
(530)752-2913

May 12,2000

Contra Costa Community Development Department
Attn. Dennis M. Marry, Director
651 Pine Street
Martinez CA 94553

Dear Mr. Marry,

This letter is to notify you that the University of California, Davis, is submitting a proposal to CALFED entitled 'Food resources for zooplankton in the Sacramento-San Joaquin River Delta'. CALFED has requested that all investigators submitting proposals to CALFED notify the Board of Supervisors and Planning Departments in counties in which work will be conducted. This letter serves to provide that notification.

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Sincerely,

A. Mueller-S

Anke Mueller-Solger
Project Manager, Postdoctoral Research Scientist

UNIVERSITY OF CALIFORNIA, DAVIS

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DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY

ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-8576

Anke Mueller-Solger
(530)752-2913

May 12,2000

Department of Environmental Management
Planning Services
601 Texas Street
Fairfield, CA 94533

Dear Sir or Madam,

This letter is to notify you that the University of California, Davis, is submitting a proposal to CALFED entitled 'Food resources for zooplankton in the Sacramento-San Joaquin River Delta'. CALFED has requested that all investigators submitting proposals to CALFED notify the Board of Supervisors and Planning Departments in counties in which work will be conducted. This letter serves to provide that notification.

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Sincerely,

-/-

M e Mueller-Solger
Project Manager, Postdoctoral Research Scientist

UNIVERSITY OF CALIFORNIA, DAVIS

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY

ONE SHIELDS AVENUE
DAVIS. CALIFORNIA 95616-8576

Anke Mueller-Solger
(530)752-2913

May 12, 2000

Clerk of the Bord
County Board of Supervisors
580 Texas St.
Fairfield, CA 94533

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Sincerely,

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Project Manager, Posidoctoral Research Scientist

UNIVERSITY OF CALIFORNIA. DAVIS

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY
Anke Mueller-Solger
(530)752-2913

ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-8576

May 12,2000

Clerk of the Board of Supervisors
Administration Building, Suite 6700
1010 Tenth Street
Modesto, CA 95354
(209) 525-6414

Dear Sir or Madam,

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Project Manager, Postdoctoral Research Scientist

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DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY
Anke Mueller-Solger
(530)752-2913

ONE SHIELDS AVENUE
DAVIS. CALIFORNIA 95616-8576

May 12,2000

County Planning Office
Suite 3400
1010 Tenth Street
Modesto, CA 95354
(209) 525-6330

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DEPARTMENT OF ENVIRONMENTAL SCIENCE AND POLICY
ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-8576

Anke Mueller-Solger
(530)752-2913

May 12, 2000

Clerk of the Board
Yolo County Board of Supervisors
County Administration Building
625 Court Street,
Woodland, CA 95695

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Anke Mueller-Solger
Project Manager, Postdoctoral Research Scientist

STATE OF CALIFORNIA-- THE RESOURCES AGENCY GRAY DAVIS, *Governor*

DEPARTMENT OF WATER RESOURCES
ENVIRONMENTAL SERVICES OFFICE
3251 S STREET
SACRAMENTO, CA 95816-7017

May 11,2000

Dr. A. Mueller-Solger
Department of Environmental
Science and Policy
University of California, Davis
1 Shields Avenue
Davis, California 95616

Dear Dr. Mueller-Solger:

Your proposed CALFED study will contribute considerably to our understanding of the potential ecological impacts of phytoplankton community composition and biomass on production at the base of the Sacramento-San Joaquin River estuarine food web.

The Department of Water Resources has monitored phytoplankton in the Sacramento-San Joaquin Delta for 30 years, and has recently implemented a concurrent sampling program of phytoplankton and zooplankton with the Department of Fish and Game.

Because your study will be of value for our management of estuarine resources, DWR is willing to assist you by contributing up to two months of senior staff time. Specifically, Dr. Peggy Lehman will assist with analysis of historical phytoplankton and zooplankton data collected by our program during the fiscal year of your study. Her research and publications on the Sacramento-San Joaquin River apply directly to your work.

Sincerely,

Z. P. Hymanson

Zachary Hymanson, Chief
Monitoring and Analysis Branch

California Department of Fish and Game
Central Valley Bay-Delta Branch
4001 N. Wilson Way
Stockton, Califomia 95205
May 11,2000

Dr. Anke Mueller-Solger
Department of Environmental Science and Policy
1 Shields Avenue
University of California, Davis
Davis, California 95616

Dear Dr. Mueller-Solger;

This is to inform you that the Department of Fish and Game's Neomysis/Zooplankton Study will be able to collaborate with you in your proposed study of food resources for copepods in the Sacramento-San Joaquin Delta. The collaboration would involve joint field sampling and data base sharing among other things. I look forward to working with you.

Sincerely,

James J. Orsi
Senior Specialist
Central Valley-Bay Delta Branch

STATE OF CALIFORNIA—THE RESOURCES AGENCY
PETE WILSON, Governo
DEPARTMENT OF WATER RESOURCES
ENVIRONMENTAL SERVICES OFFICE
3251 S STREET
SACRAMENTO CA 95816-7017

May 11, 2000

Anke Mueller-Solger, Ph.D.
Department of Environmental Science and Policy
1 Shields Avenue
University of California, Davis
Davis, CA 95616

I read **with** interest your CALFED proposal, "Food resources for copepods in the Sacramento-San **Joaquin River** Delta". **As you *know,*** there is evidence of density-dependent effects in several ecologically and economically-significant Ray-Delta species. Density dependence may **be** in large part **a result** of food web effects such as **the** introduction of **the** asian clam, Potamocorbula, which has depleted both phytoplankton and zooplankton resources. **As** suggested by **CALFED, it is** possible that habitat 'restoration may increase production at **these** lower trophic levels. I am particularly pleased that,your study proposes to systematically examine lower trophic level food quantity and quality as **this** information would be of major importance For restoration planning. Based on your success with similar methods on our collaborative IEP and CALFED-funded study of the Yolo **Bypass** floodplain, 1believe **that** the proposed techniques would be feasible and **fruitful.** If funded, 1look forward to collaborating with you on your proposed zooplankton research, particularly **with** respect to seasonal habitats such as floodplain.

Sincerely,

Ted Sommer
California Department of Water Resources
3251 S Street
Sacramento CA 958**16**

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

12 May 2000

Dear Anke,

As requested, I reviewed your proposed research plan. Your proposed research will couple nicely with our current research project that aims to determine the sources, amounts, and potential availability of organic matter. Although our project has made considerable progress we are heavily reliant on bioassays for assessing the efficiency of transfer to lower trophic levels. Research that focuses on the abundance and activity of copepods would enhance our current body offindings and provide fundamental information on the ecology of delta zooplankton. The proposed work is a logical extension from our current project and will certainly move us closer to the ultimate goal of relating variations in organic matter availability to higher trophic levels. Please let us know how we can best support your proposed research. On behalf of the Cloem lab group, we look forward to continuing to work with your research group at U.C. Davis.

Sincerely,

William V. Sobczak
Hydrologist, Water Resources Division
U.S. Geological Survey
345 Middlefield Rd., MS-496
Menlo Park, CA 94025
ph: 650-329-4731
fax: 650-329-4463
email: Wsobczak@usgs.gov

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Mail Stop 465
345 Middlefield Road
Menlo Park, CA 94025

May 12,2000

Dr. Anke Mueller-Solger
Department of Environmental Science and Policy
1 Shields Avenue
University of California, Davis
Davis, CA 95616

Re: CALFED Proposal - Food resources for copepods in the Sacramento-San Joaquin **River** Delta.

Dear Dr. Mueller-Solger,

We would like to support'the above CALFED proposal for your work on copepods in the Sacramento-San Joaquin River Delta. Copepods nre an important food source for target fish specics in the Delta, although little is known about this key species and **thosc** factors that limit its survival. Understanding how changing food resources influence this species growth, reproduction and survival is critical for predicting responses of this species to planned restoration activities in the Delra. **The** complexity of the Delta requires a comprehensive investigation of each level of the food chain and this work provides a critical link between ongoing CALFED work on organic carbon at the base of the food web and resulting **fish** production in the Delta,.

The detailed investigations of species composition and feeding behavior ***of*** copepods in the Delta is complementary to our work on tha trophic transfer of selenium (Se) in the Delta food web. Your expertise in identifying zooplankton species and their food utilization in Delta habitats such as Mildred's Island has been and will continue *to* be extremely useful for the interpretation of Se levels in zooplankton and understanding their assimilation of Se from lower trophic levels. Assimilation of Se by zooplankton species has been shown to be highly variable for estuarine species. Laboratory studies **of the** assimilation of Se by various copepod species native to the Delta has been proposed and *in* combination with your work **will** provide a unique opportunity to establish the importance of copepods in the transfer of Se to higher trophic levels.

We strongly support this proposal to investigate food resources to copepods in the Delta and look forward to collaborating on projects with you in the future.

Sincerely,

Samuel N. Luorna, Senior Research Hydrologist (snluoma@usgs.gov)
A. Robin Stewart, Postdoctoral fellow (arstewar@usgs.gov)
Christian Schlekat, Postdoctoral fellow (cschleka@mailrcamnl.wr.usgs.gov)

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BODEGA MARINE LABORATORY
P.O. BOX 247
BODEGA BAY, CALIFORNIA 94923

May 13,2000

Anke Mueller-Solger
Department of Environmental Science and Policy
University of California Davis

Dear Anke;

I am writing to express my willingness and keen interest in collaborating on your proposed project, "Food resources for copepods in the Sacramento-San Joaquin River Delta". The role of lower food web and in particular the trophic linkage between zooplankton and fishes remains a key gap in our understanding of the *estuary,* one which will require better understanding before identifying potential recovery options for endangered or depressed fish populations. This issue has become increasingly complicated by rapid shifts in the composition and abundance of zooplankton species, presumably due invasions of exotic species.

Of particular concern, *Eurytemora affinis*, the traditional dominant copepod in the Delta-low salinity region has declined by several orders of magnitude, yet appears crucial for the young and adult stages of delta smelt and other species of concern The work you propose has great potential for understanding the factors regulating species such as *E. affinis*. In addition, the development of copepod cultures would be of great significance for laboratory feeding studies with fishes, and may be the missing link currently precluding the success of delta smelt culturing projects.

Best wishes with the proposal.

Sincerely,

Bill

William A. Bennett, Ph.D.
Assistant Research Scientist
John Muir Institute of the Environment &
Bodega Marine Laboratory
University of California, Davis
POB 247
Bodega Bay, CA 94923
707-875-2035

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DEPARTMENT OF ANIMAL SCIENCE
TELEPHONE: (530) 752-1250
FAX: (530) 752-0175

ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-8521

May 14,2000

To Whom It May Concern:

I am writing in support of research proposed by Dr. Mueller-Solger concerning food resources for zooplankton in the Sacramento-SanJoaquin River Delta. Copepods are one of the dominant zooplankton in the delta and are essential for the survival of many larval finfish species. This work will provide new information that is necessary to explain why the abundance of native copepods has changed. It will also determine why certain habitats may be more suitable for larval fish, based on the quantity and quality of plankton present.

As part of this work cultures of copepods would need to be established. This supply would be a valuable resource to other researchers. I am studying the feeding behavior of delta smelt *larvae* and would be interested in obtaining cultures of native copepods for prey choice experiments.

Sincerely,

Bradd Baskerville-Bridges, Ph.D

UNIVERSITY OF WASHINGTON

Department of Civil and Environmental Engineering
Environmental Engineering and Science Program

May 12th, 2000

To Whom it may concern:

I have read the CALFED proposal titled "Food resources for copepods in the Sacramento-San Joaquin River Delta" prepared by Goldman, Jassby and Mueller-Solger and found it to be outstanding. The objects outlined in this proposal are critical for developing optimal management strategies for endangered and economically important fishes in the Delta system as well as in aquatic ecosystems world-wide. This proposed research is also truly cutting edge, as understandmg the biochemical basis for variation of algal food quality for aquatic herbivores is one of the most active areas of research in limnology/marine biology at the current time. Goldman, Jassby and Mueller-Solger are a very highly qualified team to carry out this type of research. Mueller-Solger, who I understand would be actually conducting most of the field and laboratory experiments, is a young, energetic, and very bright ecologist who will bring a tremendous enthusiasm and drive to this project. I look forward to seeing the exciting results from this research if it is funded!

Sincerely,

Michael T. Brett

Michael T. Brett
Assistant Professor
Department of Civil & Environmental Engineering
University of Washington

301 More **Hall** **Box** 352700 **Seattle,** Washington 98195-2700 **Email mtbrett@u.washjngton.edu**
OFFICE (206) 616-3447 FAX (206) 685-9185

The Nature Conservancy®

Cosumnes River Preserve
13501 Franklin Boulevard
Galt, California 95632

tel 916 683-2142
fax 916 683-1702

International Headquarters
Arlington, Virginia

May 12,2000

Dr. Anke Mueller-Solger
Department of Environmental Science and Policy
University of California, Davis
Davis, CA 95616

Dear Dr. Mueller-Solgcr,

1am writing on behalf of The Nature Conservancy's Cosumnes River and Delta Project to express our support for your proposal to CALFED to investigate food resources for copepods in the Sacramento-San Joaquin Delta, and to grant you access to the Cosumnes River Preserve to conduct your study.

The Nature Conservancy **is** interested in this study because it **will.** flesh out our understanding of ecosystem functions (i.e. food web dynamics and energy transfers among different trophic levels) in seasonally-flooded areas such as the restored floodplain at **the** Cosumnes River Preserve and the Yolo Bypass. Productivity comparisons between Delta channels and seasonally-flooded lands will be valuable in guiding future restoration and management actions. This project builds on the existing CALFED and Packard-funded research programs already underway by UC Davis at the Cosumnes River Preserve. Furthermore, it will provide data to support adaptive management of aquatic **systems** in the Delta Habitat Corridor, which is a priority area for both The Nature Conservancy and CALFED, and which provides critical habitat for priority species. The proposed work will support the Conservancy's stewardship responsibilities on the Cosumnes Preserve and is consistent with the Conservancy's commitment to disseminate the **lessons** learned from the practice of adaptive management on its ecologically critical holdings.

We look forward to learning more about food web interactions in the floodplain-river-Delta ecosystem.

Sincerely,

Ramona Swenson

Ramona Swenson, Ph.D.
Senior Project Ecologist